

The documentation and process conversion measures necessary to comply with this revision shall be completed by 22 October 1999.

INCH-POUND

MIL-PRF-19500/369C
23 July 1999
SUPERSEDING
MIL-S-19500/369B
21 October 1991

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, POWER
TYPE: 2N3441, JAN, JANTX

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for NPN, silicon, power transistor. Two level of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 (similar to TO-66).

1.3 Maximum ratings. $R_{\theta JC} = 7^{\circ}\text{C/W}$; $R_{\theta JA} = 58.5^{\circ}\text{C/W}$.

P _T		V _{CBO}	V _{CEO}	V _{EBO}	V _{CER}	I _B	I _C	T _{stg} and T _J
T _A = +25°C 1/	T _C = +25°C 2/							
<u>W</u>	<u>W</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>A dc</u>	<u>A dc</u>	<u>°C</u>
3.0	25	160	140	7.0	150	2.0	3.0	-65 to +200

1/ Derate linearly 17.1 mW/°C for T_A > +25°C.

2/ Derate linearly 143 mW/°C for T_C > +25°C.

1.4 Primary electrical characteristics.

	h _{FE} V _{CE} = 4 V dc I _C = 0.5 A dc	h _{FE} V _{CE} = 4 V dc I _C = 0.5 A dc f = 100 kHz	h _{FE} V _{CE} = 4 V dc I _C = 0.5 A dc	V _{CE(sat)} I _C = 0.5 A dc I _B = 50 mA dc	Pulse response	
					t _{on}	t _{off}
				<u>V dc</u>	<u>μs</u>	<u>μs</u>
Min	25	4	15	---	---	---
Max	100	40	100	1	8	15

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAC, 3990 East Broad St., Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5961

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

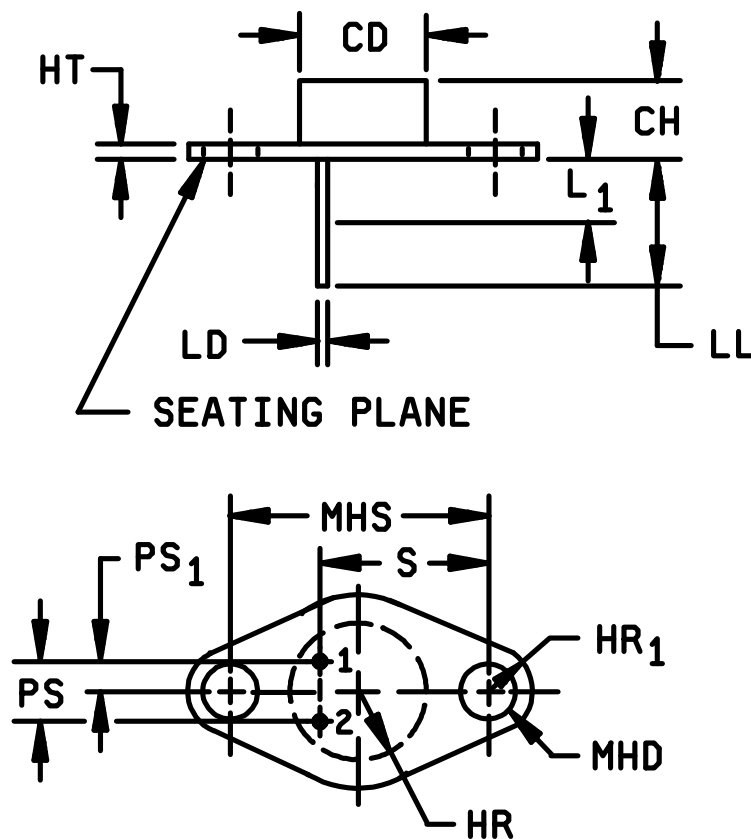


FIGURE 1. Physical dimensions.

Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.470	.500	11.94	12.70	
CH	.250	.340	6.35	8.64	
HR	---	.350	---	8.89	
HR ₁	.115	.145	2.92	3.68	
HT	.050	.075	1.27	1.91	
LD	.028	.034	0.71	0.86	4, 6
LL	.360	.500	9.14	12.70	
L ₁	---	.050	---	1.27	6
MHD	.142	.152	3.61	3.86	4
MHS	.958	.962	24.33	24.43	
PS	.190	.210	4.83	5.33	3
PS ₁	.093	.107	2.36	2.72	3
S	.570	.590	14.48	14.99	

NOTES:

1. Dimensions are in inches. Pin 1 is the emitter and pin 2 is the base. The collector shall be electrically connected to the case.
2. Metric equivalents are given for general information only.
3. These dimensions should be measured at points .050 inch (1.27 mm) \pm .005 inch (0.13 mm) \pm .000 inch (0.00 mm) below seating plane. When gauge is not used, measurement will be made at the seating plane.
4. Two places.
5. The seating plane of the header shall be flat within .001 inch (0.03 mm) concave to .004 inch (0.10 mm) convex inside a .930 inch (23.62 mm) diameter circle on the center of the header and flat within .001 inch (0.03 mm) concave to .006 inch (0.15 mm) convex overall.
6. Lead diameter shall not exceed twice LD within L₁.
7. In accordance with ANSI Y14.5M, diameters are equivalent to ϕ x symbology.

FIGURE 1. Physical dimensions – Continued.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

STANDARD

MILITARY

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Defense Automated Printing Service, 700 Robbins Avenue, Building 4D (DPM – DODSSP), Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated specifications or specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Associated specification. The individual item requirements shall be in accordance with MIL-PRF-19500, and as specified herein.

3.2 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

3.3 Interface requirements and physical dimensions. The Interface requirements and physical dimensions shall be as specified in, MIL-PRF-19500 and figure 1, (similar to TO-66), herein.

3.3.1 Lead material and finish. Lead finish shall be solderable in accordance with MIL-STD-750 and MIL-PRF-19500. Where a choice of lead material or finish is desired, it shall be specified in the contract or purchase order (see 6.2).

3.4 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in paragraph 1.3, 1.4, and table I.

3.6 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table I herein.

3.7 Qualification. Devices furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified manufacturers list before contract award (see 4.2 and 6.4).

4. VERIFICATION

4.1 Classification of Inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Screening (see 4.3)
- c. Conformance inspection (see 4.4).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500, and as specified herein.

4.3 Screening (JANTX level only). Screening shall be in accordance with MI-PRF-19500 (table IV), and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	Measurement
	JANTX level
9	Not applicable
11	I_{CEX1} and h_{FE3}
12	Burn-in (see 4.3.1)
13	ΔI_{CEX} = 100 percent of initial value or 100 μ A dc; whichever is greater. Δh_{FE3} = ± 25 percent Subgroup 2 table I herein.

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows:

$$T_A = +30^\circ\text{C} \pm 5^\circ\text{C}.$$

$$V_{CB} \geq 100 \text{ V dc}.$$

$$T_J = +187.5^\circ\text{C} \pm 12.5^\circ\text{C}.$$

NOTE: No heatsink or forced air cooling on the devices shall be permitted.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500, and table I herein. Electrical measurements (end-points) shall be in accordance with the applicable inspections of table I, group A, subgroup 2 herein.

TABLE I. Group A inspection.

Inspection 1/ 	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Breakdown voltage, collector to base	3011	Bias condition D; pulsed (see 4.5.1), $I_C = 100 \text{ mA dc}$	$V_{(BR)CEO}$	140		V dc
Breakdown voltage, collector to emitter	3011	Bias condition B; $I_C = 100 \text{ mA dc}$, $R_{BE} = 100\Omega$, pulsed (see 4.5.1)	$V_{(BR)CER}$	150		V dc
Breakdown voltage, collector to emitter	3011	Bias condition A; $I_C = 100 \text{ mA dc}$, $V_{BE} = -1.5 \text{ V dc}$, pulsed (see 4.5.1)	$V_{(BR)CEX}$	160		V dc
Emitter to base current	3061	Bias condition D; $V_{EB} = 7.0 \text{ V dc}$	I_{EBO}		1	mA dc
Collector - emitter cutoff current	3041	Bias condition A; $V_{BE} = -1.5 \text{ V dc}$, $V_{CE} = 140 \text{ V dc}$	I_{CEX1}		1	mA dc
Base emitter voltage (nonsaturated)	3066	Test condition B; pulsed (see 4.5.1) $I_C = 0.5 \text{ A dc}$, $V_{CE} = 4.0 \text{ V dc}$	V_{BE}		1.7	V dc
Collector to emitter voltage (saturated)	3071	Pulsed (see 4.5.1) $I_C = 0.5 \text{ A dc}$, $I_B = 50 \text{ mA dc}$	$V_{CE(sat)}$		1	V dc
Forward current transfer ratio	3076	$V_{CE} = 4 \text{ V dc}$, $I_C = 50 \text{ mA dc}$, pulsed (see 4.5.1)	h_{FE1}	50		
Forward current transfer ratio	3076	$V_{CE} = 4 \text{ V dc}$, $I_C = 0.5 \text{ A dc}$, pulsed (see 4.5.1)	h_{FE2}	25	100	
Forward current transfer ratio	3076	$V_{CE} = 4 \text{ V dc}$, $I_C = 1 \text{ A dc}$, pulsed (see 4.5.1)	h_{FE3}	10		

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 3</u>						
High temperature operation:	3041	T _A = +150°C	I _{CEX}		5	mA dc
Collector to emitter cutoff current		Bias condition A; V _{BE} = -1.5 V dc, V _{CE} = 140 V dc				
Low temperature operation	3076	T _A = -65°C	h _{FE4}	15		
Forward current transfer ratio		V _{CE} = 4 V dc, I _C = 0.5 A dc, pulsed (see 4.5.1)				
<u>Subgroup 4</u>						
Pulse response transfer ratio	3251	Test condition A; except test circuit and pulse requirements in accordance with figure 2 herein.				
Turn-on time		V _{CC} = 30 V dc, (see figure 2); I _C = 0.5 A dc, I _B = 50 mA dc	t _{on}		8	μs
Turn-off time		V _{CC} = 30 V dc, (see figure 2); I _C = 0.5 A dc, I _{B1} = -I _{B2} = 50 mA dc	t _{off}		15	μs
Magnitude of common emitter small-signal short-circuit forward current transfer ratio	3306	V _{CE} = 4 V dc, I _C = 0.5 A dc, f = 100 kHz	h _{fe}	4	40	
Open circuit (output capacitance)	3236	V _{CB} = 10 V dc, I _E = 0, 100 kHz ≤ f ≤ 1 MHz	C _{obo}		300	pF
Small-signal short-circuit forward-current transfer ratio	3206	V _{CE} = 4 V dc, I _C = 0.5 A dc	h _{fe}	15	100	

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection ^{1/}	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 5</u>	3051	$T_C = +25^{\circ}\text{C}$ $t = 1 \text{ s}$, 1 cycle, see figure 3 $I_C = 3 \text{ A dc}$, $V_{CE} = 8.33 \text{ V dc}$ $I_C = 833 \text{ mA dc}$, $V_{CE} = 30 \text{ V dc}$ $I_C = 178.5 \text{ mA dc}$, $V_{CE} = 140 \text{ V dc}$				
Safe operating area (dc operation)						
Test 1						
Test 2						
Test 3						
<u>Subgroups 6 and 7</u>						
Not applicable						

^{1/} For sample plan, see MIL-PRF-19500.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIb (JAN and JANTX) of MIL-PRF-19500 and paragraph 4.4.2.1 herein. Electrical measurements (end-points) shall be in accordance with the applicable inspections of table I, group A, subgroup 2 herein. Delta measurements shall be in accordance with table III herein.

4.4.2.1 Group B inspection, table VIb (JAN and JANTX) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B3	1027	$T_J = +187.5^{\circ}\text{C} \pm 12.5^{\circ}\text{C}$, $T_A = +25^{\circ}\text{C} \pm 5^{\circ}\text{C}$; $V_{CB} > 24 \text{ V dc}$.
B3	2037	Test condition A. All internal leads for each device shall be pulled separately.
B5	3131	Thermal Resistance. See 4.5.2
B6	1032	$T_{\text{stg}} = +200^{\circ}\text{C}$
B7	3053	<p>Load condition C; (unclamped inductive load), (see figure 4) $T_C = +25^{\circ}\text{C}$, duty cycle $\leq 10\%$, $R_1 = 0.1 \Omega$, $t_r = t_f \leq 500 \text{ ns}$</p> <p>Test 1. $t_p = 10 \text{ ms}$, (vary to obtain I_C), $V_{BB2} = 1.5 \text{ V dc}$, $R_{BB1} = 5 \Omega$, $L = 5 \text{ mH}$ (two Super Electric Corporation type S16884 in parallel or equivalent, dc resistance $\leq 0.1 \Omega$), $V_{BB1} = 10 \text{ V}$, $R_{BB2} = 100 \Omega$, $V_{CC} = 10 \text{ V dc}$, $I_C = 3 \text{ A dc}$</p> <p>Test 2. $t_p = 10 \text{ ms}$, (vary to obtain I_C), $V_{BB2} = 1.5 \text{ V dc}$, $R_{BB1} = 50 \Omega$, $L = 100 \text{ mH}$ (two Traid C48U in series: 80 mH winding and 20 mH winding or equivalent, dc resistance $\leq 0.1 \Omega$), $V_{BB1} = 10 \text{ V}$, $R_{BB2} = 100 \Omega$, $V_{CC} = 10 \text{ V dc}$, $I_C = 0.5 \text{ A dc}$</p>
B7	3053	<p>Load condition B (see figure 4), $T_A = +25^{\circ}\text{C}$, $L = 20 \text{ mH}$ (Traid C48U or equivalent, dc resistance $\leq 0.1 \Omega$), $V_{CC} = 50 \text{ V dc}$, $I_C = 3 \text{ A dc}$, $R_{BB1} = 5 \Omega$, $V_{BB1} = 10 \text{ V dc}$, clamped voltage = 140 V dc, $R_{BB2} = 100 \Omega$, $V_{BB2} = 1.5 \text{ V dc}$</p>

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be in accordance with table I, group A, subgroup 2 herein. Delta measurements shall be in accordance with table III herein.

4.4.3.1. Group C inspection, table VII of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
C2	1056	Test condition B
	2036	Test condition A, weight = 10 pounds, t = 15 s.
C6	1026	$T_J = +187.5^{\circ}\text{C} \pm 12.5^{\circ}\text{C}$, $T_A = +25^{\circ}\text{C} \pm 5^{\circ}\text{C}$, $V_{CB} \geq 24 \text{ V dc}$.

4.4.4 Groups A, B, C, and E electrical end-point measurements. See table III for groups A, B, C, and E electrical end-point measurements.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

4.5.2 Thermal resistance. Thermal resistance measurements shall be conducted in accordance with MIL-STD-750, method 3131. The following details shall apply:

- a. I_M measurement10 mA.
- b. V_{CE} measurement voltage.....4 V dc.
- c. I_H collector heating current3 A.
- d. V_H collector-emitter heating voltage.....4 V dc.
- e. t_H heating time Steady-state (see MIL-STD-750, method 3131 for definitions).
- f. t_{MD} measurement delay time.....20 μs .
- g. t_{SW} sample window time.....10 μs maximum.

TABLE II. Group E inspection (all quality levels) for qualification only.

Inspection <u>1</u> /	MIL-STD-750		Qualification conformance inspection
	Method	Conditions	
<u>Subgroup 1</u>			22 devices, c = 1
Thermal shock temperature cycling	1051	100 cycles	
Electrical measurements		See table I, subgroup 2	
<u>Subgroup 2</u>			22 devices, c = 1
Steady-state dc	1039 or 1049	Condition A; 340 hours	
Blocking life			
Electrical measurements		See table I, subgroup 2	
<u>Subgroup 3</u>			3 devices, c = 0
Destructive physical analysis	2102	Photos of cross sections shall be submitted in the qualification report. Vendors shall retain duplicate photos	
<u>Subgroup 4</u>			22 devices, c = 1
Thermal resistance	3131	$R_{\theta JC} = 7^{\circ}\text{C/W}$ maximum. (See 4.5.2)	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 6</u>			
Not applicable			

TABLE III. Groups A, B, C, and E delta measurements. 1/ 2/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Collector to emitter cutoff current	3041	Bias condition A; V _{BE} = 1.5 V dc, V _{CE} = 140 V dc	ΔI _{CEX1}	100 percent of initial value or 100 μA dc, whichever is greater.		
2.	Forward current transfer ratio	3076	V _{CE} = 4 V dc, I _C = 0.5 A dc, pulsed (see 4.5.1)	Δh _{FE2}	±25 percent change in initial recorded value.		
3.	Thermal resistance	3131	See 4.5.2	R _{θJC}	7°C/W		

1/ The delta measurements for table VIb (JAN and JANTX) of MIL-PRF-19500 are as follows:

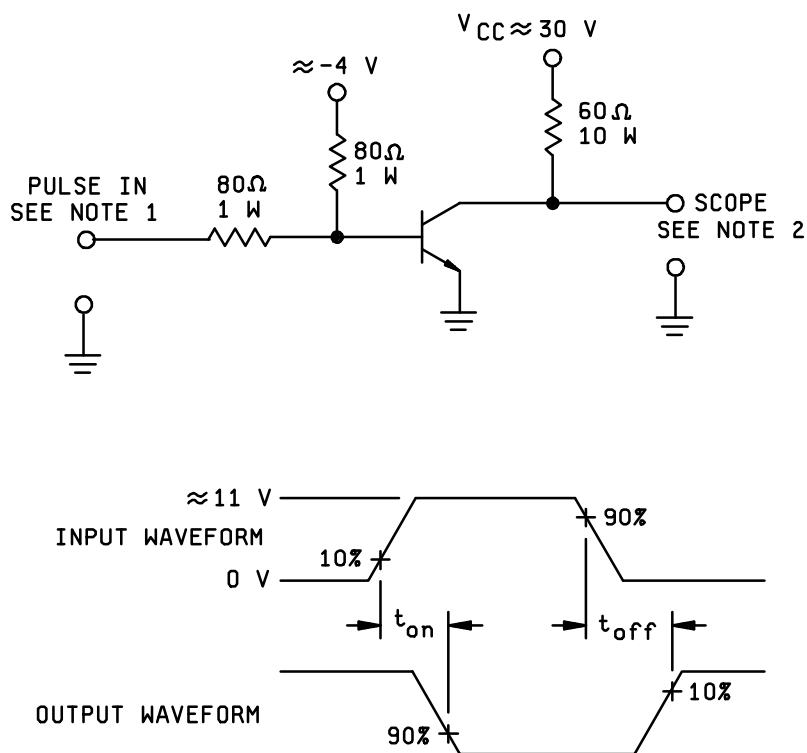
- a. Subgroup 3 see table III herein step 2 and 3.
- b. Subgroup 6 see table III herein step 2.

2/ The delta measurements for table VII (JAN and JANTX) of MIL-PRF-19500 are as follows:

- a. Subgroup 6 see table III herein steps 2 and 3.

5. PACKAGING

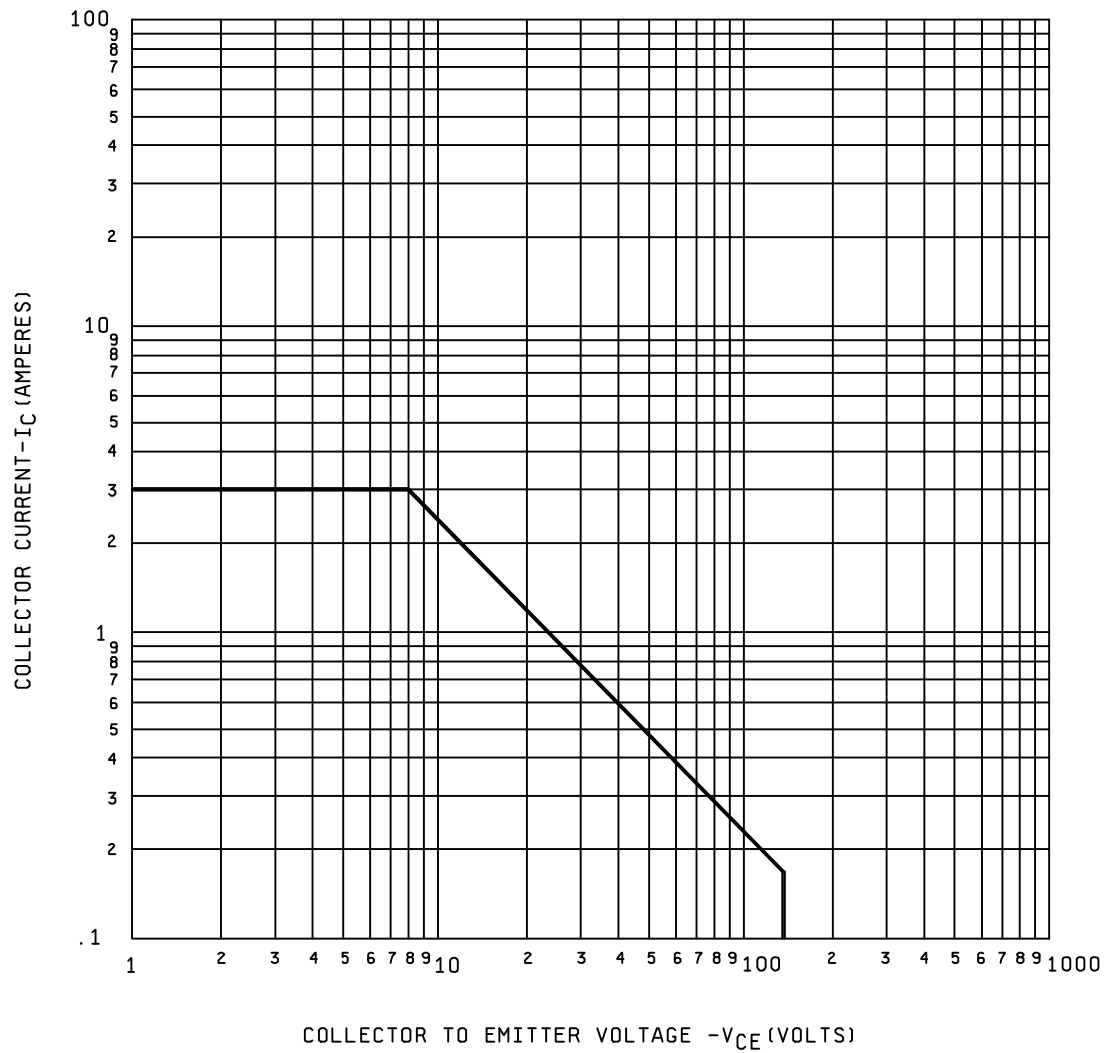
5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Points' packaging activity within the Military Department or Defense Agency, or within the Military Departments' System Command. Packaging data retrieval is available from the managing Military Departments' or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.



NOTES:

1. The rise time (t_r) and fall time (t_f) of the applied pulse shall be each $\leq 20\text{ ns}$; duty cycle ≤ 2 percent; generator source impedance shall be 50Ω ; pulse width = $20\text{ }\mu\text{s}$.
2. Output sampling oscilloscope: $Z_{in} \geq 100\text{ k}\Omega$; $C_{in} \leq 50\text{ pF}$; rise time $\leq 20\text{ ns}$.

FIGURE 2. Pulse response test circuit.

FIGURE 3. Maximum safe operating area graph (continuous dc).

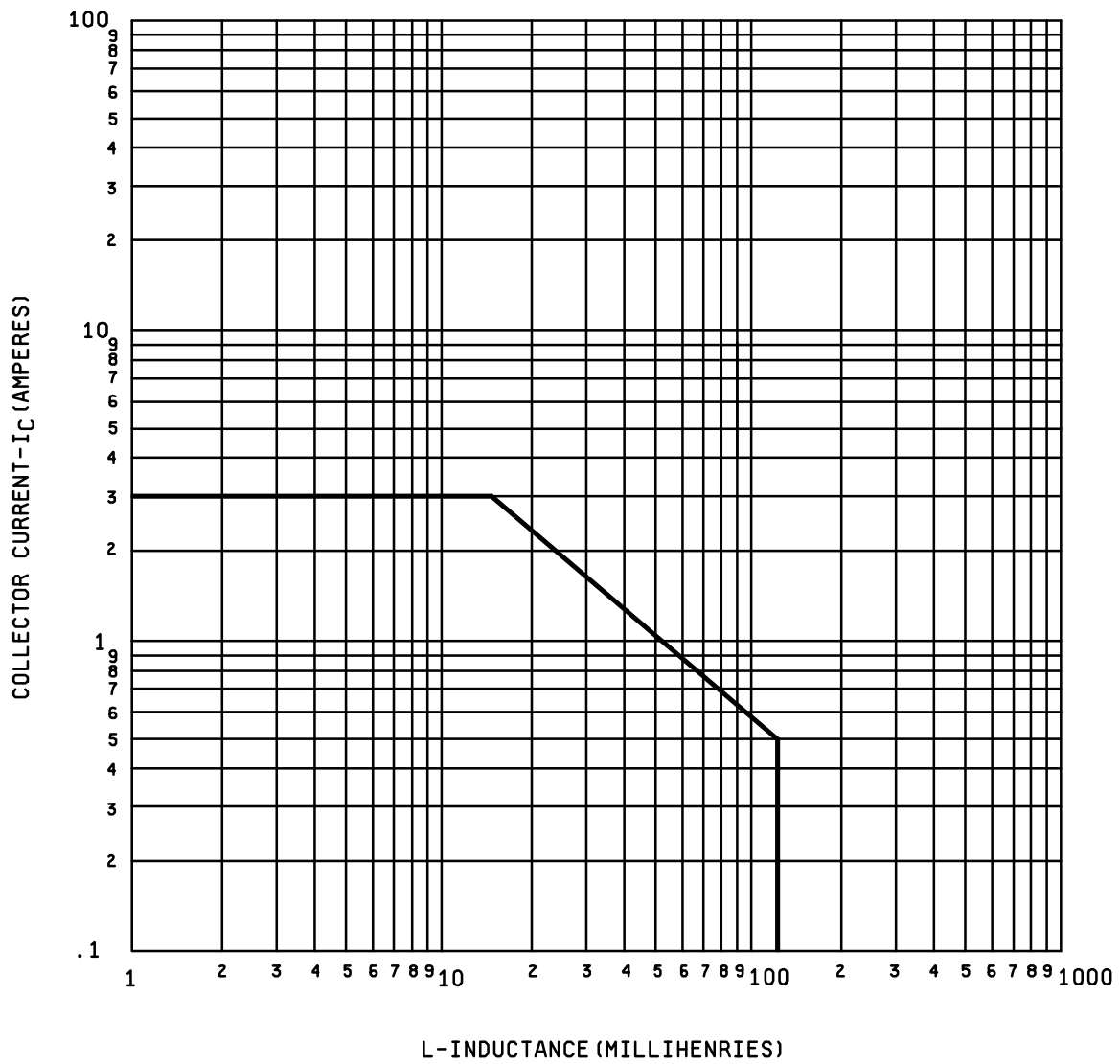


FIGURE 4. Safe operating area for switching between saturation and cutoff (unclamped inductive load).

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Notes. The notes specified in MIL-PRF-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Issue of DODISS to be cited in the solicitation and, if required, the specified issue of individual documents referenced (see 2.2.1).
- b. Lead finish (see 3.3.1).
- c. Type designation and product assurance level.
- d. Packaging requirements (see 5.1).

6.3 Substitution information. Devices covered by this specification are substitutable for the manufacturer's and user's part number. This information in no way implies that manufacturer's part numbers are suitable as a substitute for the Part or Identifying Number (PIN). The term PIN is equivalent to the term (part number, identification number, and type designator) which was previously used in this specification.

6.4 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

6.5 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturer's List QML-19500 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, DSCC-VQE, Columbus, OH 43216.

Custodians:

Army - CR
Navy - EC
Air Force - 11
NASA - NA
DLA - CC

Preparing activity:
DLA - CC

(Project 5961-2158)

Review activities:

Army - AR, AV, MI, SM
Air Force - 13, 19, 80
Navy - AS, CG, MC, OS, SH

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-PRF-19500/369C

2. DOCUMENT DATE (YYYYMMDD)

3. DOCUMENT TITLE

SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, POWER, TYPE: 2N3441, JAN, JANTX

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First Middle Initial)*

b. ORGANIZATION

c. ADDRESS *(Include Zip Code)*

d. TELEPHONE *(Include Area Code)*
(1) Commercial
(2) DSN
(If applicable)

7. DATE SUBMITTED
(YYYYMMDD)

8. PREPARING ACTIVITY

a. NAME
Alan Barone

b. TELEPHONE *(Include Area Code)*
(1) Commercial 614-692-0510 (2) DSN 850-0510

c. ADDRESS *(Include Zip Code)*
DSCC-VAT
3990 East Broad Street
Columbus, Ohio 43216-5000

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:
Defense Standardization Program Office (DLSC-LM)
8725 John J. Kingman Road, Suite 2533
Fort Belvoir, Virginia 22060-6221
Telephone (703)767-6888 DSN 427-6888

DD Form 1426, FEB 1999 (EG)

WHS/DIOR, Feb 99

PREVIOUS EDITIONS ARE OBSOLETE.